

CLAIMS

1. An augmented reality system comprising:
 - a camera (19) for capturing an image, the camera being movably located at a local site,
 - a registering unit (38), generating graphics and registering the generated graphics to the image from the camera, to provide a composite augmented reality image,
 - a display device (5) located at a remote site, physically separated from the local site, for displaying a view comprising the composite augmented reality image, and
 - a communication link (1), for communication of information between the local and the remote site,
characterized in that the system further comprises a specifying unit (7), for specification of a position and an orientation in the remote site, the camera is arranged such that its position and orientation is dependent on the specified position and orientation, and the registering unit is adapted for registering the generated graphics to the image in dependence of the specified position and orientation.
2. A system according to claim 1, characterized in that said specifying unit comprises a tracking unit (7), adapted for determining the position and orientation of a movable device (5) located at the remote site, the registering unit (38) is adapted for registering the generated graphics to the image in dependence of the position and orientation of the movable device, and the camera (19) is arranged such that its position and orientation are dependent on the position and orientation of the movable device.
3. A system according to claim 2, characterized in that said movable device is the display device (5).
- 35 4. A system according to any of the previous claims, characterized in that it further comprises a robot (17, 20) located at the

local site, the camera is mounted on the robot and the robot is arranged in such a manner that the movement of the robot depends on the specified position and orientation.

- 5 5. A system according to any of the previous claims, characterized in that it further comprises a graphical generator (37), for generation of a graphical representation, and the registering unit (38) is adapted for generating graphics based on the graphical representation.
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- 10 6. A system according to any of the previous claims, characterized in that it further comprises operator input means (13), located at the remote site, provided for feeding data related to the graphics to be displayed to the system, and the system is
15 adapted for generating the graphics based on said data.
- 15 7. A system according to claim 6, characterized in that said operator input means comprises a pointing device (13) and a tracking unit for determining the position of the pointing device
20 and that the system is adapted for generating a graphical representation of a point being presently pointed out by the pointing member based on the position of the pointing device.
- 20 8. A system according to any of the previous claims, characterized in that it comprises a second specifying unit (27), for specifying a position and an orientation in the local site, a second registering unit (42), generating graphics and registering the generated graphics to the real environment or an image of the environment of the local site, in dependence of the position
30 and orientation specified by the second specifying unit (27), and a local display device (26) adapted for displaying a view comprising the environment of the local site and said generated graphics projected on the environment.
- 35 9. A system according to claim 8, characterized in that it comprises a second movable device (26) located at the local site,

- the second specifying unit comprises a second tracking unit (27), for determining the position and the orientation of the second movable device.
- 5 10. A system according to claim 11, characterized in that said second movable device is the local display device (26).
- 10 11. A system according any of the claims 9-10, characterized in that it comprises a second camera (28) for capturing an image, the camera being arranged in a fix relation to the second movable device (26), and the second registering unit (42), is adapted for registering the generated graphics to the image from the second camera (28), to provide a composite augmented reality image, and that the local display device is adapted for displaying a view comprising the composite augmented reality image.
- 15 12. A system according to any of the claims 8-11, characterized in that the remote display device (5) is adapted for displaying a view seen from a first visual angle that depends on the position and orientation received from the first mentioned specifying unit (7) and the local display device (26) is adapted for displaying the same view as the remote display device (5) seen from a second visual angle that depends on the position and orientation received from the second specifying unit (27).
- 20 13. A system according to any of the previous claims, characterized in that it comprises means for transferring voices between the remote and the local site via the communication link.
- 25 14. A system according to any of the previous claims, characterized in that the communication link is a network.
- 30 15. A method for remotely displaying an augmented reality view comprising graphical information overlaid an image captured at a local site, the method comprising:

- specifying a position and an orientation at a remote site that is physically separated from the local site,
 - positioning and orientating a camera (19), located at the local site, according to the specified position and orientation,
- 5 - obtaining an image from the camera,
- generating graphics,
 - generating a composite augmented reality image based on the image, the graphics, and the specified position and orientation, and
- 10 - displaying a view comprising the composite augmented reality image.
16. A method according to claim 15, wherein specifying a position and an orientation comprises determining the position and orientation of a movable device (5) located at the remote site and the camera is positioned and orientated according to the position and orientation of the movable device (5).
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17. A method according to claim 16, wherein said movable device is a remote display device (5) and that said view comprising the composite augmented reality image is displayed on the remote display device.
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18. A method according to any of the claims 15-17, comprising controlling the movements of a robot (17), having the camera (19) mounted thereon, according to the position and orientation of the movable device (5).
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19. A method according to any of the claims 15-18, comprising obtaining data related to the graphics to be displayed, and generating the graphics based on said data.
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20. A method according to any of the claims 15-19, comprising receiving information about the position of a pointing device (13) and generating graphics representing a point, being presently
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- pointed out by the pointing member, based on the position of the pointing device (13).
21. A method according to any of the claims 15-20, comprising
5 specifying a position and an orientation in the local site, and displaying a second view comprising the environment of the local site and the generated graphics projected on the environment in dependence of the locally specified position and orientation.
- 10 22. A method according to claim 21, wherein specifying a position and an orientation in the local site comprises determining the position and orientation of a second movable device (26) located at the local site.
- 15 23. A method according to claims 22, wherein the second movable device is a local display device (26) and that said second view, comprising the environment of the local site and the graphics, is displayed on the local display device.
- 20 24. A method according to claim 22 or 23, comprising capturing an image from a second camera (28) being arranged in a fix relation to the second movable device (26), and registering the generated graphics to the image from the second camera (28), to provide a composite augmented reality image, and displaying
25 a view comprising the composite augmented reality image on the local display device (26).
25. A method according to any of the claims 21-24, comprising generating second graphics and displaying the second view
30 comprising the environment of the local site and the second graphics projected on the environment in dependence of the specified position and orientation.
- 35 26. A method according to claim 25, comprising generating a local graphical representation, generating a remote graphical representation, transferring the local and remote graphical repre-

sentations between the local and the remote site, generating the first mentioned graphics based on the local and the remote graphical representation, and generating the second graphics based on the local and the remote graphical representation.

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27. A method according to any of the claims 21-26, wherein the view displayed in the remote site comprises the environment of the local site and the overlaid graphics seen from an visual angle that depends on the position and orientation specified in the remote site and the view displayed in the local site comprises the environment of the local site and the overlaid graphics seen from an visual angle that depends on the position and orientation specified in the local site.

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28. A computer program product directly loadable into the internal memory of a computer, comprising software code portions for performing the steps of any of the claims 15–27, when said product is run on a computer.

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29. A computer readable medium having a program recorded thereon, where the program is to make a computer perform the steps of any of the claims 15–27, when said program is run on the computer.

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30. Use of a system according to any of the claims 1–14 for remote programming of an industrial robot.

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31. A system according to any of the claims 11-14, characterized in that it comprises a handheld display device (62) comprising the display member (64) and the camera (8).

32. A system according to claim 31, characterized in that the handheld display device is arranged so that the user seems to look directly through the display.

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33. Use of the method according to any of the claims 1-13 for a paint application.